



INFORMATION SHEET: DEVELOPING A MARGINAL ABATEMENT COST CURVE (MACC)

This information sheet is designed to assist you creating a simple MACC for your organisation. This information sheet will:

- Explain key terms.
- Outline data requirements to get started.
- Outline the process for creating a MACC.
- Provide simple calculation methods to calculate Net Present Value and Marginal Abatement Cost for abatement projects.
- Provide an example of calculating Net Present Value and Marginal Abatement Cost for an abatement projects.

This information sheet can be used in conjunction with the accompanying worksheet for you to enter the calculations into and build a simple MACC. It is anticipated that most organisations will use spreadsheets or other tools to create detailed MACCs.

Please note that many processes have been simplified for the purpose of this information sheet. Accounting processes such as discounting rates that would normally be used in project evaluation have been left out for the purpose of simplicity.

KEY TERMS

- **Abatement project** is any project to reduce net greenhouse gas (GHG) emissions.
- **Marginal Abatement Cost (MAC)** is the cost per tonne of GHG emissions of the abatement project.
- **Marginal Abatement Cost Curve (MACC)** is a graph demonstrating all the MACs of available abatement projects to facilitate decision-making.
- **Net Present Value (NPV)** (for this purpose) is the current cost of a project minus savings during the investment timeframe. It can be a positive or negative value.
- **Investment timeframe** is the organisation's time frame for investment decisions.

KEY DATA NEEDED

For each possible abatement project you will need:

- Full cost of implementation of the project (\$)
- Investment timeframe (years)
- Amount of GHG emissions saved over investment timeframe (usually in tonnes of CO₂-e)
- Amount of money that will be saved from the project (\$)

Note: for more information on possible costs and savings of each project, refer to EPA Victoria's EREP Toolkit Module 4: Calculating a payback period

MACC CALCULATION PROCESS:

1. Conduct an energy audit or similar process to identify multiple projects that can reduce GHG emissions. See key data needed for the information that is required from this process.
2. Assign an investment timeframe.
3. Calculate NPV for each project.
4. Calculate MAC for each project.
5. Enter each project's MAC into cost curve graph.

CALCULATION METHOD SUMMARY – NET PRESENT VALUE

$$\text{Simple Net Present Value (NPV)*} = \text{Cost of implementing abatement project} - \text{Savings from abatement project during investment timeframe}$$

* Note: there are numerous methods for creating NPVs, usually including a discount rate to represent the diminishing value of money over time. However for the purpose of this simple example, no discount rate is used.

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CALCULATION METHOD SUMMARY – MARGINAL ABATEMENT COST

$$\text{Marginal Abatement Cost (MAC)} \quad (\$/\text{t CO}_2\text{-e}) = \frac{\text{Net Present Value (\$)}}{\text{GHG emissions saved from abatement project during investment timeframe (t CO}_2\text{-e)}}$$

EXAMPLE – CALCULATING NPV AND MAC FOR ABATEMENT PROJECTS

Project 1: A cookie manufacturer is considering an upgrade of its factory lighting. The project will involve changing existing lamps to new generation tri-phosphors, which will reduce the number of lamps by 30 per cent. The project will also involve the installation of time-delay switches, occupancy sensors and devices that detect daylight to control lighting levels. These measures localise the control of the lights so they are not running unnecessarily. For an investment of \$17,000 to buy and install the new lighting system, the cookie manufacturer will save \$2,000 per annum in electricity. The project will save 400 tonnes of CO₂-e across an investment time frame of four years. Calculate the NPV and MAC.

$$\begin{aligned} \text{NPV} &= \$17,000 \text{ (investment)} - \$2,000 \times 4 \text{ (total savings)} \\ &= \$9,000 \end{aligned}$$

$$\begin{aligned} \text{MAC} &= \frac{\$9,000 \text{ (NPV)}}{400 \text{ t CO}_2\text{-e (GHG savings)}} \\ &= \$22.50/\text{t CO}_2\text{-e} \end{aligned}$$

Project 2: The same cookie manufacturer identifies that some of its equipment can be shut down completely during the weekend. This will have no cost to the business and will save \$6,000 and 300 tonnes of CO₂-e over four years.

$$\begin{aligned} \text{NPV} &= 0 - \$6,000 \\ &= -\$6,000 \end{aligned}$$

$$\begin{aligned} \text{MAC} &= \frac{-\$6,000 \text{ (NPV)}}{300 \text{ t CO}_2\text{-e (GHG savings)}} \\ &= -\$20.00/\text{t CO}_2\text{-e} \end{aligned}$$

(Adapted from EREP toolkit 4)

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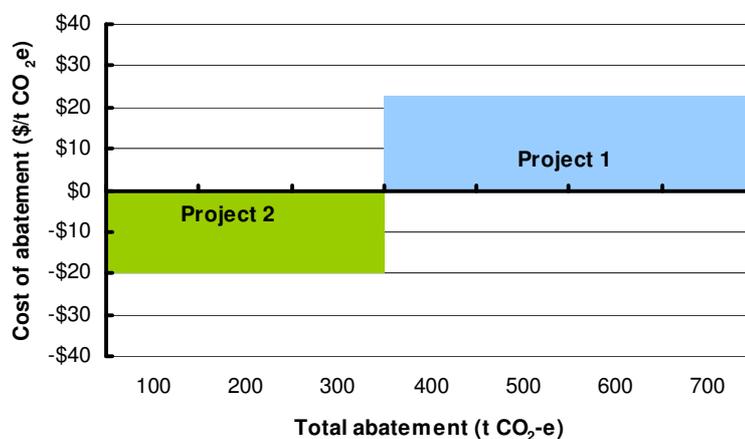
EXAMPLE – GRAPHING MARGINAL ABATEMENT COST

- List all abatement projects in order from lowest to highest Marginal Abatement Cost.

PROJECT	MAC	PROJECT ABATEMENT	TOTAL ABATEMENT
2	-\$20.00	300	300
1	\$22.50	400	700

- Graph the MAC on Y-axis and Total Abatement on X-axis

Marginal Abatement Cost Curve



KEY RESOURCES:

EPA Victoria, **EREP Toolkit, Module 4: Calculating payback periods**, February 2008

Kinesis, **Achieving Cost Effective Carbon Abatement**, August 2009